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The American Midland Naturalist

PUBLISHED BI-MONTHLY BY THE UNIVERSITY OF NOTRE DAME.
NOTRE DAME, INDIANA.

Vol. XII.

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CESTODES OF THE GENUS MESOCESTOIDES FROM THE OPOSSUM AND THE CAT.

JUSTUS F. MUELLER, ROOSEVELT WILD LIFE STATION, N. Y. STATE
COLLEGE OF FORESTRY.

The cestode species, *Mesocestoides latus*, was originally described by the author (Mueller, 1927, 1928) on the basis of material collected from the skunk, *Mephitis minnesotae*, in Minnesota. Recently, other material of this genus has come to my hands, and has been provisionally assigned to this species. Comparison of this material, however, with the type specimens reveals variations which could not have been anticipated, and accordingly it proves necessary to revise the original description of this form in certain respects. In the course of this study the value of different characters as criteria of species differentiation in this genus has been somewhat clarified.

My original note of this species diagnosed the form as follows:

"This form is roughly similar to *M. corti*, but larger. Its length varies around 9 cm.; its maximum width is 1.5 to 2.0 mm. The scolex is blunt and not set off from the neck. The total number of proglottids is about 350 to 450. The great width of the proglottids, in contrast to their short length, is a striking feature of the form, since in no other is the proportion so large.

"The ovaries and vitellaria lie almost in a transverse

line, vitellaria outermost. The organs are greatly crowded antero-posteriorly. The longitudinal canals are very much compressed by the testes, and are narrower and straighter than in *M. corti*. The transverse commissures are almost obliterated."

In the extended description (Mueller 1928) the length was raised to 12 cm. and the following summary was given:

"*M. latus* differs from its nearest relative, *M. corti*, mainly in the greater length and width of strobila, smaller and weaker suckers, longer neck, greater number of proglottids, larger terminal proglottids and egg capsule, and strikingly different proportion of the proglottids, which suggest the name of the species, the topography of the ovaries and vitellaria, the number, size, and arrangement of the testes, and by the narrower and straighter excretory canals with their obscure commissures. In addition, the forward termination of the uterus with reference to the anterior border of the proglottid, location of the cirrus pouch, and the method of formation of the egg capsule are quite different in the two species."

The new material of this species which has come to my hands consists of a specimen collected from a kitten at Rochester, Minn. by Dr. H. E. Essex of the Mayo Foundation, and three fragmented specimens collected from the opossum in Illinois. Because of limited material the worm from the kitten could not be studied in detail. Each of these collections indicated a greater length for the species than had previously been stated. That from the kitten seemed to be about 25 cm. in length; that from the opossum about 50 cm., approaching the size of the largest species of the genus. The width in both cases was approximately that stated originally —1.5 to 2 mm. The total number of proglottids must be raised from my original estimate of 350 to 450 to a thousand or more at the greatest stage of development. The excretory canals and commissures, which were very obscure in the type material, are in the present worms well developed, often being dilated to an excessive degree. The susceptibility of this

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system to changes under different stages of contraction vitiates the value originally ascribed to it as a diagnostic character.

The characters which seem to be constant in this species are the shape of the head and suckers, and their relation to the neck, as originally described, the great number of proglottids, the relatively large size of the worm for this genus, and the proportion of the proglottids, with width always considerably exceeding the length until the gravid state is attained. The most important specific character is the relative position of ovaries and vitellaria. In other nearly related species the ovaries and vitellaria are either equidistant (as in *M. corti*), or the vitellaria are closer together than the ovaries (as in *M. variabilis*). In *M. latus* however the ovaries are in the form of a bilobed mass, confluent near their middle or posterior level, with the shell gland in their anterior angle; and the vitellaria are roughly spherical, lying lateral and ventral to the ovaries often with a considerable intervening distance. The topography of these glands is shown in figs. 3 to 7.

The great crowding of the organs is also a constant characteristic, sharply distinguishing the species from *M. corti*, and making it difficult to secure an accurate testicular count. The absence of calcareous corpuscles, as noted in the original descriptions, seems to be constant.

There are certain points of resemblance between *M. corti* and *M. latus*, brought out by this further study. These are the character of the scolex and suckers, the absence of the calcareous corpuscles, and general aspect of the worms. The chief points of difference are the size of the worms and topography of the ovaries and vitellaria. The possibility that these two species may be merely different contraction phases of the same animal does not seem probable because in the material studied by me their differences as stated seem to be constant. Unfortunately, all material came to me ready fixed, but seemed to be fully expanded. The difference in size of the worms and in the size and systematic position of their

hosts seems also to weigh in favor of the view that the two worms are distinct.

The following comparative table of data for the material of *M. latus* from different sources, and for *M. corti*, sums up the available information on these species.

CHARACTERS	<i>M. latus</i>			<i>M. corti</i>
	EX: SKUNK	KITTEN	OPOSSUM	MOUSE
Total length	12 m. + --	12-30 cm.	50 cm. + --	4-8 cm.
Number proglots.	350-450	hundreds	1000 + --	200-300
Seolex width	0.55-0.75 mm.	0.54 mm.	0.57-0.75 mm.	0.5-0.6 mm.
Suckers l. x w.	0.23 x 0.19 mm.	0.14 x 0.12 mm.	0.25 x 0.19 mm.	0.3 x 0.2 mm.
Neck length	1.47-3.8 mm.	1.95 mm.	2.3-6.0 mm.	1.5-2.0 mm.
Proportions of mature proglots. length x width	1 x 4	1 x 4	1 x 4	from square to longer than broad.
Maximum width proglots.	2.0 mm.	2.0 mm.	2.3 mm.	1.0 mm.
Vitellaria, position	. . . ven	tro-lateral to ovaries . . .		ventral to ovaries.
Excretory canals	obscure, straight	well developed, straight	well developed, straight	Large, wavy.
Terminal proglots l. x w.	3.0 x 1.0 mm.	2.5 x 0.75 mm.	3.3 x 1.0 mm.	1.5 x 0.9 mm.
Egg capsule, greatest diam.	0.6 mm.	0.45 mm.	0.55 mm.	0.35 mm.
Eggs, diameter	22-25 ,u	18 ,u	20 ,u	21-23 ,u

I have shown that the species *M. variabilis* varies considerably in different hosts (Mueller, 1928). It seems probable that the differences noted in *M. latus* are also due to this host influence. It would be particularly desirable to re-study the form from the kitten from adequate fresh material. The small suckers, and other slight peculiarities of this worm, might make it necessary to separate it from other forms. The difficulty of species differentiation in the genus Mesocestoides is historical. The differences between species are slight, and often obscured by the tendency toward individual variation. To date there have been three forms described from mammals in this country. These may be separated by the following key.

KEY TO THE NORTH AMERICAN SPECIES OF MESOCESTOIDES FROM MAMMALS

- 1 (2) Ovaries and vitellaria markedly lobate, vitellaria small and close together; scolex well set off from neck, calcareous corpuscles present.
M. variabilis Mueller 1927. Host: silver fox, skunks, etc. California.
- 2 (1) Ovaries and vitellaria rounded or only slightly lobate, scolex not set off from neck, calcareous corpuscles absent----- 3
- 3 (4) Ovaries and vitellaria equidistant, mature proglottids roughly as long, or longer, than broad, excretory canals sinuous.
M. corti Hoepli 1925. Host: house mouse, Colorado.
- 4 (3) Vitellaria farther apart than ovaries, ovaries confluent near posterior ends, in form of a V. Sexually active proglottids about 4 times as broad as long.
M. latus Mueller 1927. Host: skunk, cat, Minn.; Opossum, Ill.

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EXPLANATION OF FIGURES

(Value of scale: 0.5 mm. Same for all figs.)

c—cirrus
cs—cirrus sac
ex—excretory canals
ov—ovaries
t—testis
u—uterus
vd—vas deferens
vt—vitellaria

FIGS. 1 and 2. Scolices of *M. latus* from opossum.

FIG. 3 *M. latus* from opossum, toto preparation, anterior maturing segments.

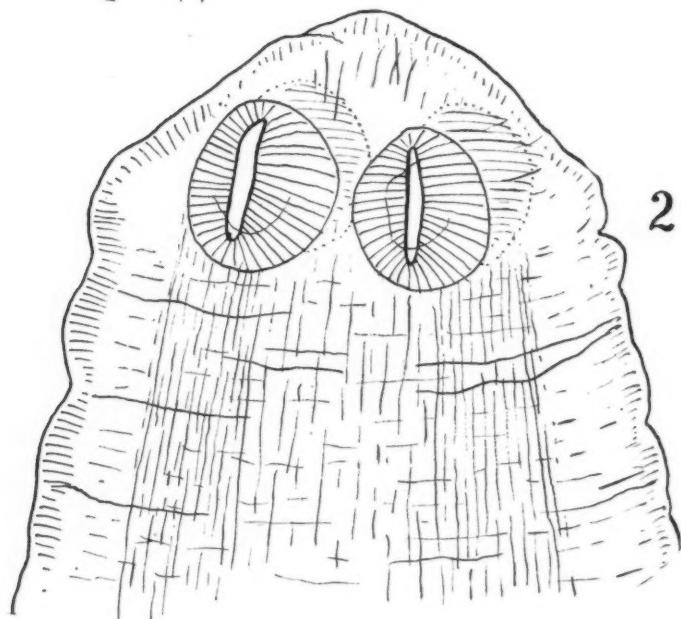
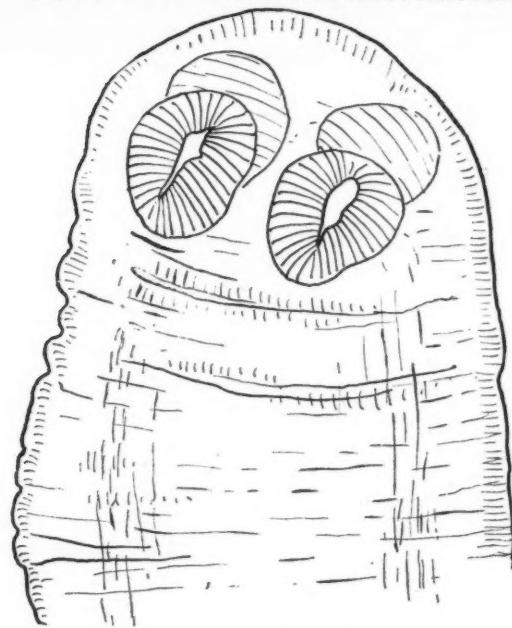
FIG. 4. *M. latus* from opossum, frontal section of mature proglottid thru vitellaria, near ventral surface.

FIG. 5. *M. latus* from opossum, frontal section of mature segments thru ovaries, near dorsal surface.

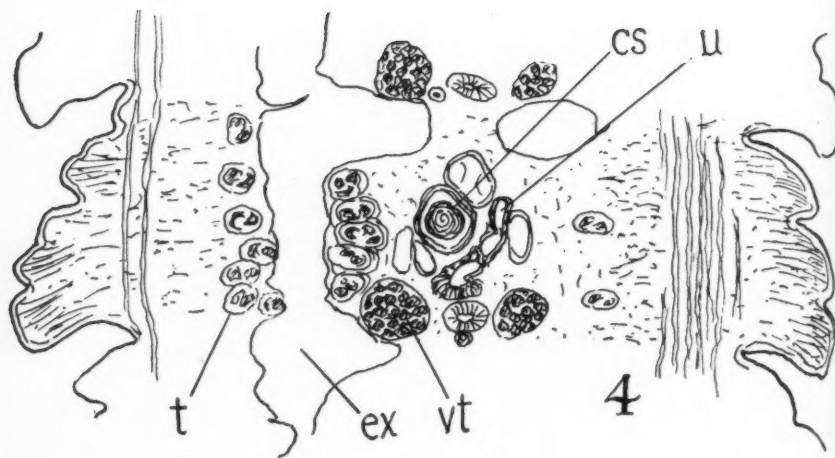
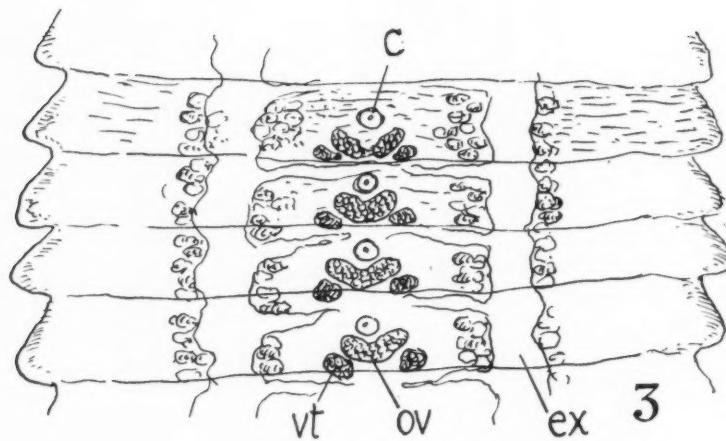
FIG. 6. Cross section of *M. latus* from opossum, mature segment, passing thru greatest diameter of vitellaria.

FIG. 7. Cross section of mature proglottid of *M. latus* from opossum anterior to Fig. 6, passing thru greatest diameter of ovaries.

FIG. 8. Scolex of *M. latus* from the kitten.

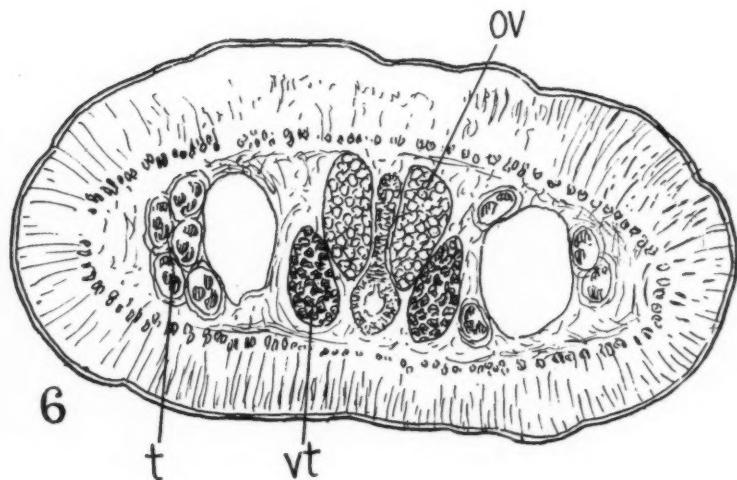
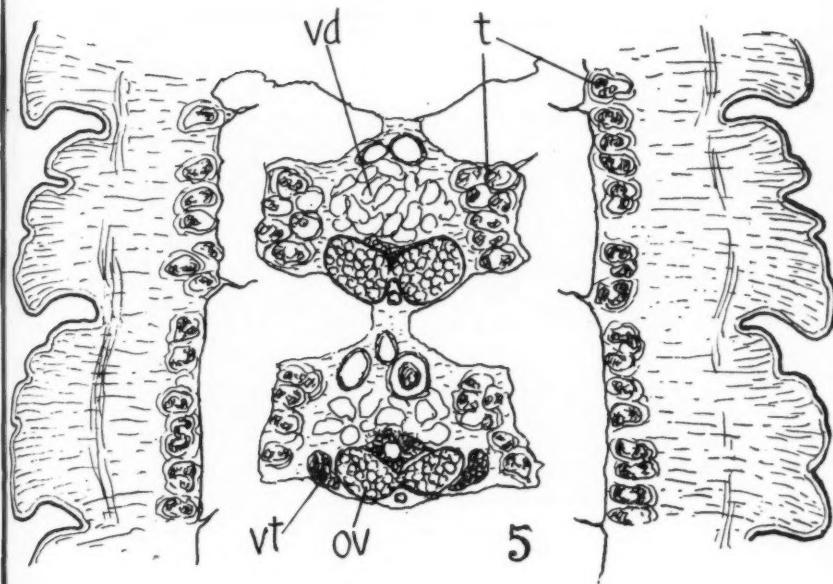


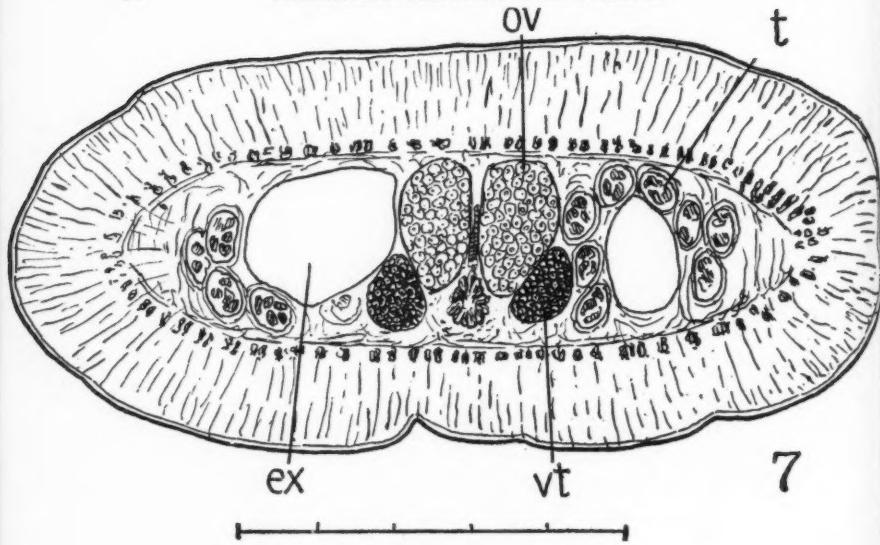
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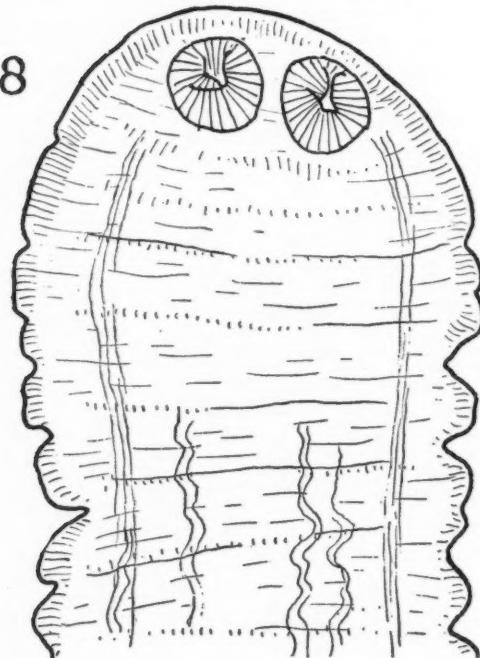
CESTODES OF THE GENUS MESOCESTOIDES

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FERNS OF OKLAHOMA**BENJAMIN FRANKLIN BUSH**

Some thirty years ago I spent several months of two years collecting plants in a number of places in the Indian Territory, mostly in the northern and eastern parts of the Territory, in Craig, Rogers, Tulsa and Creek Counties, along the line of the Frisco railroad.

I was not then especially interested in Ferns, and made no attempt to get a complete representation of this interesting group of plants, but I collected eighteen of the more common species. Judging from the citations given in the latest editions of the Manuals and Floras of the Eastern United States, one would suppose that Oklahoma did not have a very large Fern Flora, or that but little was known of it by the authors of these works, as only seven species of Ferns and Fern Allies are cited for the Indian Territory and Oklahoma by all the Manuals and Floras.

It would seem that this was due in large part to negligence in working out the full ranges, as there have been placed on record at various times up to 1902, by various writers, twenty-three species, and I distributed four more in my Indian Territory sets of 1894 and 1895, to the principal herbaria in the United States, making twenty-seven species.

Many other collections of plants have been made in the Indian Territory, by Bigelow, Fendler, Gregg, Palmer, Parry, Pope and Wright, in the first half of the last century, or not much after the middle of it, by Dr. Butler from 1875 to 1880, by Waugh in 1893, Blankinship in 1895, Carleton and Sheldon in 1891, and Eggert in 1903, and it is very likely that many specimens of Ferns and Fern Allies were collected by them, but I am unable to see their collections at this time.

The first record of Indian Territory Ferns that I have seen is by Engelmann in 1878, who describes *Isoetes Butleri* from Limestone Gap, collected by Dr. Butler, and who also records *Isoetes melanopoda*, collected at the same place by Butler.

Davenport in his Distribution of Ferns in the United States of North America in 1883, cites *Pellaea atropurpurea*, *Woodsia obtusa*, *Aspidium Goldieanum* and *Cheilanthes Eatoni* for the Indian Territory, but I am inclined to believe that the specimens of *Aspidium* that Davenport had from the Indian Territory are really *Aspidium marginale*, and not *A. Goldieanum* as these two are sometimes confused.

In 1891, Mr. C. S. Sheldon and Mr. M. A. Carleton were commissioned by the Secretary of Agriculture, Washington, D. C., to make a botanical survey of the Indian Territory, and adjoining parts of Kansas, Texas and New Mexico, and in 1892 their collections were worked up by Prof. Holzinger of the Department of Agriculture, who published their lists in Contributions from the United States National Herbarium, Volume 7, No. 6. 1892. The number of species of Ferns and Fern Allies given in these two lists for the Indian Territory is fourteen, of which nine are newly recorded here, making fifteen species now known for the Territory.

In 1897, Mrs. Britton in her Revision of *Ophioglossum* in Bull. Torr. Club 24: 55, records *Ophioglossum Engelmanni* from the Indian Territory, raising the number of recorded species to sixteen.

In 1900, Underwood in the sixth edition of Our Native Ferns, records *Isoetes Butleri* and *I. melanopoda* from Lime-stone Gap, Indian Territory, both collected by Butler, no doubt based on part of the specimens sent to Dr. Engelmann by Butler. In this same year E. E. Bogue published his "Annotated Catalogue of the Ferns and Flowering Plants of Oklahoma," and in this list he gives thirteen species of Ferns and Fern Allies, but there are really only twelve, for I have put his two species of *Equisetum* together. In this list he records *Botrychium virginianum*, *Filix fragilis*, *Adiantum Capillus-Veneris*, *Polystichum acrostichoides* and *Marsilea vestita*, these making twenty-one species now recorded for the State.

In 1901, Dr. Maxon issued his "List of Ferns and Fern Allies of North America," and in this list he cites *Isoetes Butleri* and *I. melanopoda* for Oklahoma, this name now ap-

pearing for the first time, both these citations being based no doubt on the specimens sent to Dr. Engelmann by Butler; he also records *Cheilanthes lanosa*, *Athyrium Filix-foemina*, *Dryopteris marginalis*, *D. Thelypteris* and *Woodsia oregana*, and thus bringing the recorded number of species for Oklahoma up to twenty-three, for I have concluded that the *Woodsia mexicana* of the Carleton list is really *Woodsia oregana*. This year also witnessed the appearance of Dr. Gilbert's "List of North American Pteridophytes," in which he records again the two species of *Isoetes* first recorded by Engelmann in 1878.

Britton in his manual in 1905, knew, or cared to cite, but two species of Ferns for the Indian Territory, *Woodsia obtusa* and *Isoetes Butleri*, the last cited from Limestone Gap, and probably based on Butler's specimens which were sent to Dr. Engelmann.

Three years after the appearance of the Britton Manual, Robinson and Fernald brought out the New Gray's Manual, in which they record again the two species of *Isoetes* recorded by Engelmann, this time from Oklahoma, this name now appearing for the first time in any Manual or Flora.

Dr. Small in his Flora in 1913, departs a little from the custom of all those preceding him, by citing *Isoetes Butleri* from the Indian Territory and *Dryopteris hexagonoptera* from Oklahoma. In this same year Britton issued the second edition of the Illustrated Flora, in which the two species of *Isoetes* recorded by Engelmann are again recorded for Oklahoma, besides *Onoclea sensibilis*, *Dryopteris marginalis*, *D. hexagonoptera* and *Woodsia oregana*. The number of Ferns and Fern Allies now known to be recorded for Oklahoma is twenty-five.

As I write this I have before me the April-June number of the American Fern Journal for the year 1918, in which Mr. F. C. Greene records some species of Ferns and Fern Allies he has found in Osage County, Oklahoma, seventeen species in all, five of which are here recorded for the first time, thus bringing the number of species recorded for the state up to thirty; this paper of Mr. Greene's is merely a

brief note on the species of Ferns found by him while engaged in geological work in Osage County for one of the oil companies of Tulsa, Oklahoma, and does not pretend to be an exhaustive list. Mr. Greene's work more often takes him into fields where the country has but little attraction for Ferns, and considering that he had been in Oklahoma only a short time, and unable to give but a very small part of his time to the notice of Ferns, this list of seventeen species, the largest so far given, is worthy of notice.

The Flora of Oklahoma, and the Fern Flora in particular, has much been neglected by writers, and but little is known of the Ferns of the State by botanists in general. It is true that there have appeared pretty good accounts of the Ferns of all the adjoining States, those of Arkansas by Harvey in 1881, of Texas by Bush in 1903, of New Mexico by Wooton and Standley in 1915, and Kansas by Smith in 1911 and 1913, but no one has given us a complete list of the Ferns of Oklahoma.

As I am writing this, I have just received the American Fern Journal for 1927, in which Mr. Greene has a paper entitled "Notes on the Pteridophyta of Oklahoma," in which he lists 39 species, quite a number not before recorded for Oklahoma, and the largest list given to date. Allowing for a few misidentifications, this list is still very long and complete, at least for the western part of the State, which it apparently seems to be mostly based on. Annotations on this list will be made more fully under some of the species further on in this paper. A paper on some Oklahoma species by Mr. Wherry, has just come to hand, in the American Fern Journal of 1928, in which eleven species are given for Dripping Spring, Ottawa County, and in this small list is one species new for Oklahoma, *Asplenium Bradleyi*, which was to be expected, as it had been collected in southwestern Missouri and northwestern Arkansas.

Oklahoma has quite a number of chains of mountains in the eastern, central and western parts, and there are many scattered groups and single mountains nearly all over the State, the Washita Mountains in the western part of the

State, the Wichita Mountains in southwestern part, the Kiamichi, Ozark, Wild Horse and Brushy Mountains, in the eastern part.

The principal streams are as follows; the Arkansas River, which enters the State in the north center, and leaves it in the east center, flowing southeastwardly; the Cimarron River, which enters the State at the west side of Cimarron County, and follows an easterly and southeasterly course, and joins the Arkansas River a little northeast of the center of the State in Tulsa County; the Canadian River, which enters the State in the west center, and flows eastward almost clear across the State and joins the Arkansas not far from the eastern boundary; the Red River which forms the southern boundary of the State; the Elk River which coming down out of the mountainous portions of southwestern Missouri and northwestern Arkansas, enters the State in the north end of Delaware County, and empties into the Neosho River in the southern part of Ottawa County; the Neosho River, which enters the State in the northeastern corner and flows southward and joins the Arkansas River in Muskogee County; the Verdigris River, which enters the State in the north center of Nowata County, and flows south and joins the Arkansas River in Muskogee County; the North Fork of the Red River which enters the State in the west center of Beckham County and flows southeasterly and joins the Red River at the southeast corner of Jackson County; the Washita River, which enters the State in the west center of Roger Mills County, and flows easterly and southeasterly more than half across the State, and joins the Red River at the southeast corner of Marshall County; Beaver Creek, which rises in the foothills in New Mexico and enters the State near the southwestern corner of Cimarron County, and flows easterly and southeasterly nearly across the State, and joins the Canadian River in McIntosh County.

The Red River, the North Fork of the Red River, the Canadian and Cimarron and Beaver Creek, all have more or less deep cañons in New Mexico, Colorado and the Pan Handle of Texas, and the walls of these cañons are admirably

adapted to Fern Life, and quite a number of western and southwestern species reach Oklahoma along these cañons. Numerous small streams flow northward and southward and empty into the Arkansas, the Canadian and Red River.

Oklahoma may be roughly divided into five different floras, as follows: (1) the northeastern and northern part, as far west as the 98th Meridian, which is mostly a prairie region with low river banks and rather low hills, the Flora of which is much like that of northwestern Arkansas, southwestern Missouri and southeastern Kansas, where are found such species as *Ophioglossum Engelmanni*, *Botrychium obliquum*, *Osmunda cinnamomea*, *O. regalis*, *Woodsia obtusa*, *Polystichum acrostichoides*, *Filix fragilis*, *Dryopteris marginalis*, *D. Thelypteris*, *Pellaea atropurpurea*, *P. glabella*, *Phegopteris hexagonoptera*, *Camptosorus rhizophyllus*, *Asplenium platyneuron*, *A. resiliens*, *Cheilanthes lanosa*, *C. Feei*, *Athyrium asplenioides*, *Notholaena dealbata*, *Azolla caroliniana* and *Equisetum laevigatum*: (2) the southeastern and southern part, as far west as the 98th meridian, which is mostly lowlands or sloping to the lowlands, the Flora of which is like that of Southern Arkansas and northeastern Texas, and where such species as *Polypodium polypodioides*, *Osmunda regalis*, and other marsh-loving species should be found: (3) the eastern and central part, as far west as the 98th meridian, which is more or less mountainous, and where one might expect such species as *Asplenium resiliens*, *A. Trichomanes*, *Adiantum Capillus Veneris*, *A. pedatum*, *Pteridium aquilinum*, *Cheilanthes alabamensis*, *C. tomentosa*, *C. Feei*, *C. lanosa*, *Selaginella rupestris* and *Isoetes Butleri*: (4) the western part of the State, all west of the 98th meridian, which is more or less mountainous, interspersed with sandy plains, and belonging to that great tract known as the American Desert or Great Plains, the Flora of which is that of Northern and Western Texas, where a number of species of the southwest extend, such as *Pellaea Wrightiana*, *Cheilanthes Eatoni*, *Notholaena Standleyi*, *Marsilea vestita* and *Selaginella Sheldoni*: (5) the Neutral Strip, from the 100th to the 103rd Meridian, which reaches southeastern Colorado and north-

eastern New Mexico, and which is a part of the Great Plains, and is more or less cut up into deep cañons, several of which are notable, as the Cimarron Cañon, the Beaver Cañon, which come down from Colorado, New Mexico and Texas. These Cañons are very attractive to Ferns, and several far western and southwestern species reach their northeastern limits there, such as *Woodsia oregana* and *W. scopulina*.

In the preparation of this paper I have been materially assisted by Dr. Maxon of the United States National Museum, Mr. E. J. Palmer, collector for the Arnold Arboretum, and Mr. F. C. Greene, of Tulsa, Oklahoma, to whom it is a pleasure to acknowledge my indebtedness. Dr. Robinson of the Gray Herbarium has kindly examined and reported on a number of specimens for me, credit for which is given under several species in the list following.

I am also under obligation to Dr. George Moore, of the Missouri Botanical Garden, who very kindly allowed me to examine all the Oklahoma specimens of *Equisetum* in the Garden Herbarium.

LIST OF OKLAHOMA FERNS AND FERN ALLIES.

1. OPHIOGLOSSUM ENGELMANNI Prantl, 1884.

Cotton County, Greene, 1918; Indian Territory, Butler, 1875; Mrs. Britton, in Bull. Torr. Club 24: 55. 1897;; Butler's specimens were distributed as *Ophioglossum vulgatum mucronatum*; Navina, Logan County, Stevens 177, April 25, 1913, as *O. vulgatum*; Murray County, Stevens, 1913, as *O. vulgatum*: Okemah, Okfuskee County, Greene September 5, 1918; Osage County, Greene in Am. Fern Journal 8: No. 2, 59. 1918; Payne County, Stevens, 1913, as *O. vulgatum*; Stephens County, Greene, 1918; Oklahoma, Greene, in Am. Fern Jour. 27; 126. 1927; Osage County, Greene, May 25, 1918; Rogers County, Greene, May 20, 1923. This species should be common all over the eastern half of the State, as it is very common in southwestern Missouri and northeastern Arkansas, in rocky barrens.

(*Ophioglossum vulgatum* L. 1753).

Collected at McNab, Arkansas, by Mr. E. J. Palmer, and should therefore be looked for in southeastern Oklahoma along the Red River.

2. *BOTRYCHIUM OBLIQUUM* Muhl. 1810.

Sapulpa, Creek County, *Bush* 855, September, 1894; Sapulpa, Creek County, *Bush* 1057, May, 1895.

3. *BOTRYCHIUM VIRGINANUM* (L.) Sw. 1801.

Tulsa, Tulsa County, Greene, in Am. Fern Journ. 27: 126. 1927; Le Flore County, *Stevens* 2758, 1913; Logan County, Bogue in Catalogue, 7, 1900; Payne County, *Stevens*, 1913.

Should be common in rich woods along streams in the mountainous parts of the eastern half of the State.

4. *OSMUNDA CINNAMOMEA* L. 1753.

Antlers, Pushtamaha County, *Palmer* 8328, July 17, 1915; Broken Bow, McCurtain County, *Palmer* 10479, July 14, 1916; Osage County, *Stevens*, 1913.

5. *OSMUNDA REGALIS* L. 1753.

Page, Le Flore County, *Stevens* 2722, September 9, 1913; Le Flore County, *Stevens* 3428, 1913; Osage County, *Greene*, June 30, 1918; Osage County, *Greene*, September 17, 1917; Osage County, *Greene*, in Am. Fern. Journ. 27: 126. 1927; Oklahoma, *Greene*, no date given; Osage County, *Greene*, in Am. Fern. Journ. 8: No. 2 60 1918: Sapulpa Creek County, *Bush* 851, September, 1894; Page, LeFlore County, *Palmer* 21607, May 30, 1922.

6. *ONOCLEA SENSIBILIS* L. 1753.

Osage County, *Greene*, in Am. Fern Journ. 27: 129. 1927; McCurtain County, Mrs. Nice, in *Greene*, in Am. Fern Journ. 27: 129 1927; Fort Towson, Choctaw County, *Houghton* 3957, May 31, 1916; Kiamachi Mountains, *Emig*, September 1, 1915; Sapulpa, Creek County, *Bush* 852, July, 1894; Sapulpa, Creek County, *Bush* 853, September, 1894; Oklahoma, Britton & Brown, in Ill. Flora, 1913.

7. *WOODSIA OBTUSA* (Spreng.) Torr. 1840.

Caddo County, *Greene*, 1918; Creek County, *Greene*, 1918; Greer County, *Greene*, 1918; Indian Territory, Davenport in Catalogue, 1883; Logan County, *Greene*, 1918; Okfuskee County, *Greene*, 1918; Osage County, *Greene*, in Am. Fern

Journ. 8: No. 2. 59. 1918; Oklahoma, Britton in Manual, 1905; Osage County, Greene, June 30, 1918; Pawnee County Greene, 1918; Payne County, Greene, 1918; Poteau Le Flore County, Palmer 8265, July 12 1915: Sapulpa, Creek County, Bush 849, July, 1894; Thackerville, Love County, Houghton 3592, April 8, 1916, as *Cystopteris fragilis*; Tishomingo, Johnston County, Palmer 6472, September 9, 1914; Oklahoma, Bogue in Catalogue, 7, 1900; Oklahoma, Greene, in Am. Fern Journ. 27: 129. 1927; Headquarters Mountain, Granite, Greer County, Stevens 1008, as *Filix fragilis*; Canyon Bank, Weatherford, Carter County, Stevens 905, June 14, 1913; Thackerville, Love County, Stevens 58, April 15, 1913; Stillwater, Payne County, S. E. Myers 384, August 7, 1897.

8. WOODSIA OREGANA D. C. Eaton, 1865.

Cimarron Cañon, Carleton 365, August, 1891, determined by Holzinger as *W. mexicana*. Dr. Maxon has kindly corrected this for me. Oklahoma, Maxon in Check List, 1901; Jones' Ranch, Baca County, a few rods from the Oklahoma Line, Greene, in Am. Fern Journ. 27: 129. 1927.

Dr. Maxon has written me that an old specimen of Palmer's collection may be an underscribed species. (*Woodsia mexicana* Fee, 1854).

As stated above, Carleton's 365, determined by Holzinger as this species, was examined and corrected by Dr. Maxon. (*Woodsia scopulina* D. C. Eaton, 1865).

Has been collected at Magazine Mountain, Arkansas by Palmer, and undoubtedly occurs in Eastern Oklahoma in the mountainous parts.

9. FILIX FRAGILIS (L.) Underw. 1900.

Ottawa, Ottawa County, Stevens 2410, August 27, 1913; Pawhuska, Osage County, Stevens 2007, August 10, 1913; Oklahoma, Greene, in Am. Fern Journ. 27: 129, 1927; Osage County, Greene, June 30, 1918; Greer County, Stevens, 1913; Lincoln County, Bogue in Catalogue, 7. 1900; Osage County, Greene, in Am. Fern Journ. 8: No. 2. 59. 1913; Ottawa, Ottawa County, Stevens 2410, August 27, 1913; Pawnee County, Greene, 1918; Payne County, Bogue in Catalogue, 7. 1900; Sapulpa, Creek County, Bush 850, September, 1894;

Kenton, Cimarron County, Stevens 492½, 1913, possibly *Woodsia oregana*; Kenton, Cimarron County, Stevens 496, May 5, 1913, but does not look like *Filix gragilis* as named, nor like *Woodsia obtusa*, the fronds narrowly lanceolate in outline and but little cut; possibly this and the last are both *Woodsia oregana*, which has been collected in Oklahoma so far as known only in Cimarron County; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Jour. 62. 1928.

10. *FILIX BULBIFERA* (L.) Underw. 1900.

Ozark Region, Greene, in Am. Fern Journ. 27: 129. 1927; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 63, 1928.

Harvey in his Ferns of Arkansas says this species is quite plentiful in northwestern Arkansas, the fronds nearly two feet long, and it is common in McDonald County, Missouri, along the Elk River.

11. *POLYSTICHUM ACROSTICHOIDES* (Michx.) Schott, 1834.

Gray Horse, Osage County, Stevens, 1913; Osage County, Greene 1918; Idabell, McCurtain County, Houghton 3911, May 29, 1916; Page, Le Flore County, Stevens 2679, September 8, 1913; Pawhuska, Osage County, Bogue in Catalogue, 7. 1900; Sapulpa, Creek County, Bush 848, September, 1894; Ozark Region, Greene, in Am. Fern Journ. 27: 129, 1927; Osage County, Greene, in Am. Fern Journ. 27: 129, 1927; Rich Mountain, Page, Le Flore County, Stevens 2679, September 8, 1913; Dripping Spring Ottawa, Ottawa County, Wherry in Am. Fern Journ. 62, 1928.

(*Polystichum acrostichoides* Schweinitzii (Beck) Small, 1893).

This form of the Christmas Fern should be found in all Eastern Oklahoma, as it is common on rich northern hillsides along Elk River, below Noel, Missouri.

12. *DRYOPTERIS MARGINALIS* (L.) A. Gray, 1848.

Oklahoma, Greene, in Am. Fern Journ. 27: 129, 1927; Creek County, Stevens, 1913; Tecumseh, Pottawatomie County, and in the Wichita Mountains, Mrs. Nice, in Greene, in Am. Fern Journ. 27: 129, 1927; Comanche County, Stevens, 1913; Le Flore County, Stevens, 1913; Osage County,

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Greene, March 19, 1917; Osage County, Greene, in Am. Fern Journ. 8: No. 2. 59, 1918; Pawhuska, Osage County, Bogue in Catalogue, 7, 1900; Pawnee County, Greene, 1918; Poteau, Le Flore County, Palmer 12639, July 27, 1917; Quanah Mountain, Comanche County, Sheldon, 196 and 241, July 1891; Sapulpa, Creek County, Bush 846, September, 1894; Sapulpa, Creek County, Bush 1444, October, 1895; Tecumseh, Pottawatomie County, Bogue in Catalogue, 7, 1900; Kenton, Cimarron County, Stevens 497, 1913, as *D. Filix-mas*, but apparently not that species; Indian Territory, Davenport in Catalogue, 1883, as *D. Goldieana*; Page, Le Flore County, Palmer 20957, April 27, 1922; Oklahoma, Britton & Brown in Ill. Flora, 1913; Oklahoma, Maxon in Check List, 1901; Page, Le Flore County, Palmer 22250, October 9, 1922; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 63, 1928.

13. **DRYOPTERIS FILIX-MAS (L.) Schott, 1834.**

Kenton, Cimarron County, Stevens 497, 1913, but surely not the real *Filix-mas*, as none of the authorities assign it anywhere near Cimarron County, Oklahoma. The specimens are too young to satisfactorily determine, and they possibly are *D. marginalis*; Fern Hollow, Kenton, Cimarron County, Mrs. Nice, in Greene, in Am. Fern Journal 27: 129, 1927, and the same doubt exists in this case as in the last.

(*Dryopteris Goldieana* (Hook.) A. Gray, 1848).

Indian Territory, Davenport in Catalogue, 1883, but I am sure that some other species of *Dryopteris* has been mistaken for this species, most likely *D. marginalis*, specimens of which are sometimes hard to place.

14. **DRYOPTERIS THELYPTERIS (L.) A. Gray, 1848.**

Sapulpa, Creek County, Bush 847, September, 1894; Sapulpa, Creek County, Bush 1319, September, 1895; Indian Territory, Maxon in Check List, 1901, under *D. simulata*, based on specimens collected by Bush, and determined by Davenport as *D. simulata*.

(*Dryopteris simulata* Davenport, 1894).

Indian Territory, Maxon in Check List, 1901, based on

specimens collected by Bush, and determined by Davenport as this species, but now known to be *D. Thelypteris*, q. v.

15. **PHEGOPTERIS HEXAGONOPTERA** (Michx.) Fee, 1850-52.

Idabell, McCurtain County, *Houghton* 3908, May 29, 1916; Sapulpa, Creek County, *Bush* 854, October, 1894; Oklahoma, Small in Flora, 1913; Oklahoma, Britton & Brown in Ill. Flora, 1913; Page, Le Flore County, *Palmer* 21644, June 1, 1922. Should be common in the mountainous parts of Eastern Oklahoma, as it is common in southwestern Missouri, and is recorded by Harvey in Ferns of Arkansas as abundant on dry hills in northwest Arkansas; Ozark Region, Greene, in Am. Fern Journ. 27: 128; 1927.

16. **CAMPTOSORUS RHIZOPHYLLUS** (L.) Link, 1833.

Pawhuska, Osage County, *Stevens* 2003, 2005, 1913; Oklahoma, Maxon, in Am. Fern Journ. 7 No. 4, 104, 1917; Osage County, Greene, in Am. Fern Journ. 8: No. 2. 59, 1918; Oklahoma, Greene, in Am. Fern Journ. 27: 128. 1927; Osage County, Greene, June 30, 1918; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 63. 1928.

Probably common in the mountainous parts of Eastern Oklahoma, as it is common in the shaded ravines in southwestern Missouri, and is recorded by Harvey in Ferns of Arkansas, to be plentiful in northwest Arkansas, both upon limestone and sandstone cliffs.

17. **ASPLENIUM PLATYNEURON** (L.) Oakes, 1878.

Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 62. 1928; Oklahoma, Greene, in Am. Fern Journ. 27: 128. 1927; Cimarron County, Neutral Strip, *Carleton* 366, August, 1891; Lincoln County, Bogue in Catalogue, 7. 1900; Okfuskee County, Greene, 1918; Osage County, Greene, in Am. Fern Journ. 8: No. 2. 59. 1918; Page, Le Flore County, *Palmer* 12635, July 27, 1917; Page, Le Flore County, *Stevens* 2710, September 8, 1913; Pawnee County, Greene, 1918; Payne County, Bogue in Catalogue, 7. 1900; Sapulpa, Creek County, *Bush* 845, July, 1894 (*Asplenium pinnatifidum* Nutt. 1818).

Recorded by Harvey in Ferns of Arkansas as occurring on limestone cliffs in northwestern Arkansas, and should

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therefore be sought for in extreme Eastern Oklahoma in the mountainous parts.

(*Asplenium pycnocarpon* Spreng. 1804).

Occurs on rich northern exposed hillsides along Elk River, below Noel, Missouri, and recorded by Harvey in Ferns of Arkansas as occurring sparingly in northwest Arkansas upon rich banks in shaded woods, and should therefore be found in the mountainous parts of Eastern Oklahoma.

18. *ASPLENIUM BRADLEYI* D. C. Eaton, 1873.

Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 62. 1928. Occurs on the high bluffs along the Elk River, below Noel, Missouri, and should therefore be looked for in extreme Eastern Oklahoma.

19. *ASPLENIUM RESILIENS* Kunze, 1844.

Oklahoma, Greene, in Am. Fern Journ. 27: 128. 1927; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 62 1928; Rogers County, Greene, May 20, 1923; Arbuckle Mountains, Davis, Murray County, Greene, August 28, 1911; Sand Springs, Tulsa County, Greene, date not given;; Ottawa, Ottawa County, Stevens 2413, August 27, 1913; Devil's Cañon, Hinton, Caddo County, Stevens 928, June 15, 1913; Oklahoma County, Stevens 2698.1, 1913; Kay County, Stevens 1979, 1913; Carter County, Stevens 63.1, 1913; Murray County, Greene, 1918; Osage County, Greene, 1918; Osage County, Stevens 1881, 1913; Ottawa, Ottawa County, Stevens 2347, August 27, 1913; Pontotoc County, Stevens 3274, 1913; Tishomingo, Johnston County, Palmer 6504, September 13, 1814; Without definite locality, Houghton, April 1916, Arbuckle Mountains, Davis, Murray County, Emig 466, October 29, 1915; Tishomingo, Johnston County, Houghton 2530, April 1916.

20. *ASPLENIUM TRICHOMANES* L. 1753

Arbuckle Mountains and Wichita Mountains, Mrs. Nice, in Greene, in Am. Fern Journ. 27: 128. 1927; Oklahoma, Greene, in Am. Fern Journ. 27: 128. 1927; Osage County, Greene, March 19, 1917; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 62. 1928; Osage County, Greene, in Am. Fern Journ. 8: No. 2. 59. 1918; Pawhuska,

Osage County, *C. E. Regnier*, date not given; Osage County, Bogue in Catalogue, 7. 1900; Pawnee County, *Greene*, 1918; Poteau, Le Flore County *Palmer* 9044, October 28, 1915; Quanah's Ranch, Comanche County, *Sheldon* 239, July, 1891; Sapulpa, Creek County, *Bush* 843, September, 1894; Cavanal Mountain, Poteau, Le Flore County, *Palmer* 8297, July 14, 1915.

21. *ASPLENIUM SEPTENTRIONALE* (L.) Hoffm. 1795.

Cimarron County, Miss Constance Nice, in *Greene*, in Am. Fern Journ. 27: 128. 1927.

Probably more common in extreme western Oklahoma, as it has been collected at Jones' Ranch, Baca County, Colorado, and it apparently is common there, a locality just over the Oklahoma line.

22. *ATHYRIUM ASPLENIOIDES* (Michx.) Desv. 1827.

Page, Le Flore County, *Stevens* 2682 and 2683, September 8, 1913, both labeled *Dryopteris marginalis*; Comanche County, *Stevens* 1341½, June, 1913; Broken Bow, McCurtain County, *Palmer* 10478, July 14, 1916; Idabel, McCurtain County, *Houghton* 3907, May 29, 1916; Indian Territory, Maxon in Catalogue, as *A. Filix-foemina*, but according to the excellent treatment of the species of *Athyrium* in *Rhodora* by Butters, the species of Oklahoma is *A. asplenoides*; Page, Le Flore County, *Palmer* 21608, May 30, 1922; Page, Le Flore County, *Palmer* 20956, April 27, 1922.

23. *ADIANTUM CAPILLUS-VENERIS* L. 1753.

Oklahoma, *Greene*, in Am. Fern Journ. 27: 127. 1927; Logan County, *Stevens*, 1913; Caddo County, *Greene*, 1918; Fairfax, Osage County *Greene*, in Am. Fern Journ. 8: No. 2. 60. 1918; Guthrie, Logan County, *Greene*, in Am. Fern Journ. 8: 60. 1918; Arbuckle Mountains, *Greene* 1911; Chickasha, *Greene*, June 10, 1918; Guthrie, Logan County, *Stevens* 3265, June 14, 1913; Logan County, Bogue in Catalogue, 7. 1900; Murray County, *Greene*, 1918; Osage County, *Greene*, March 19, 1917; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 63. 1928.

24. *ADIANTUM PEDATUM* L. 1753.

McCurtain County, Mrs. Nice, in *Greene*, in Am. Fern

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Journ. 27: 127. 1927; Ozark Region, Greene in Am. Fern Journ. 27: 127. 1927; Page, Le Flore County, Palmer 21651, June 1, 1922; Page, Le Flore County, Stevens 2759, August 9, 1913.

This species should be common in all the mountainous parts of Eastern Oklahoma, as it is recorded by Harvey in Ferns of Arkansas as occurring throughout Northern and Western Arkansas, where it grows most luxuriantly at the base of shelving sandstone cliffs in shaded and damp situations, and also along moist ravines in rich woods.

(*Pteridium latiusculum* (Desv.) Maxon, 1919).

Common on the barren hills along the Elk River, below Noel, Missouri, and recorded by Harvey in Ferns of Arkansas as common in northwest Arkansas, and should therefore be found in the mountainous parts of Eastern Oklahoma.

25. *PTERIDIUM LATIUSCULUM PSEUDOCAUDATUM* (Clute)

Maxon, 1919.

Ozark Region, Greene, in Am. Fern Journ. 27: 127. 1927; Page, Le Flore County, Stevens 2715, 1913.

This name is not given in Harvey's Ferns of Arkansas, but it evidently is the fern that he lists as *P. aquilina caudata*, which he says occurs sparingly in western Arkansas, and should therefore be sought for in the mountains of Eastern Oklahoma.

26. *PELLAEA ATROPURPUREA* (L.) Link, 1841.

Arbuckle Mountains, Greene, 1911; Osage County, Greene, June 30, 1918; Rogers County, Greene, May 20, 1923; Ottawa, Ottawa County, Stevens 2401 August 27, 1913; Miami, Ottawa County, Stevens 2269, August 26, 1913; Crusher Spur, Murray County, Stevens 6, April 11, 1913; Oklahoma, Greene, in Am. Fern Journ. 27: 128. 1927; Okemah, Okfuskee County, Greene, date not given; Marshall County, Greene, 1918; Caddo County, Greene, 1818; Okfuskee County, Greene, 1918; Creek County, Greene, 1918; Bochito, Bryan County, Palmer 11191, November 1, 1916; Greer County, Stevens 1042.12, 1913; Logan County, Greene, 1918; Logan County, Stevens 1663, 1913; Murray County, Greene, 1918; Osage County, Stevens 1982, 1913; Ottawa County, Stevens 2269, 1913;

Pawnee County, Greene, 1918; Payne County, Greene, 1918; Ottawa County, Stevens 2401, 1913; Indian Territory, Davenport in Catalogue, 1883; Osage County, Greene, in Am. Fern Journ. 8: No. 2. 1918; Neutral Strip, Carleton 363, August, 1891; Quanah Mountain, Comanche County, Sheldon 195, July, 1891; Sapulpa, Creek County, Bush 840, October, 1894; Stephens County, Greene 1918; Arbuckle Mountains, Davis, Murray County, Emig 456, October 29, 1915; Tishomingo, Johnston County, Palmer 6503, September 13, 1914; Washita County, Greene, 1918; Woods County, Stevens, 1913; Weatherford, Custer County, Stevens 904, June 14, 1913; Without definite locality, Bogue in Catalogue, 7, 1900.

Some of the specimens enumerated above are probably to be referred to *P. glabella*, a species which until quite recently, was not recognized; especially those cited by Davenport, and those collected by Carleton and Stevens.

27. *PELLAEA GLABELLA* Mett. 1869.

Pawnee County, Greene, 1918; Kay, Osage and Pawnee Counties, Greene, in Am. Fern Journ. 27: 128. 1927.

Undoubtedly more common than the above few collections would seem to indicate, and I suspect that some of the specimens cited under the preceding species are really this species, and it ought to be more or less common in the eastern and northern parts of the State.

28. *PELLAEA WRIGHTIANA* Hooker, 1858.

Quanah Mountain, Comanche County, Sheldon 192, July 1891, determined by Holzinger as *P. ternifolia* Link, but now corrected by Dr. Maxon, 1. c. 182. 1917; southwestern Oklahoma, Maxon, 1. c., 1917; Hallock Ranch, Cimarron County, Greene, in Am. Fern Journ. 27: 128. 1927.

(*Pellaea ternifolia* (Cav.) Link, 1841).

Sheldon's specimens No. 192, were determined by Holzinger as this species, but Dr. Maxon has changed this to *P. Wrightiana*, q. v., and *P. ternifolia* does not occur in Oklahoma so far as I know.

29. *CHEILANTHES ALABAMENSIS* (Buckley) Kunze, 1847.

Grand River, Cherokee County, Blankinship, August 20, 1895; Arbuckle Mountains, Miss Constance Nice, in Greene,

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in Am. Fern Journ. 27; 127. 1927; Dripping Spring, Ottawa, Ottawa County, Stevens 2415, August 27, 1913.

To be sought for in Eastern Oklahoma, as it occurs in the mountainous parts of southwestern Missouri and northwestern Arkansas.

30. *CHEILANTHES EATONI* Baker, 1868.

Cleveland, Pawnee County, Greene, in Am. Fern Journ. 27: 127, 1927; Cimarron County, Greene, in Am. Fern Journ. 27: 127. 1927; Cache, Comanche County, Palmer 12588, July 19, 1917, named *C. tomentosa* by Palmer, but I have not seen any specimens of *C. tomentosa* from as far west as Comanche County, Oklahoma; Chickasha, Grady County, Greene, 1918, as *C. tomentosa*; chiefly on the False Washita, between Fort Cobb and Fort Arbuckle, E. Palmer 427, 1868, fide Dr. Maxon; Cleveland, Pawnee County, Greene, November 23, 1916 as *C. tomentosa*; Headquarters Mountain, Granite, Greer County, Greene, May 4, 1918, determined by Dr. Maxon; Hinton, Caddo County, Stevens 912, June 15, 1913, as *C. tomentosa*, corrected by Dr. Robinson; Hinton, Caddo County, Stevens 929, June 15, 1913, as *C. tomentosa*; Indian Territory, Davenport in Catalogue, 1883 no doubt based on E. Palmer's collection of 1868; Kenton, Cimarron County, Stevens 436, May 13, 1913, as *C. tomentosa*, corrected by Dr. Robinson; Kenton, Cimarron County, Stevens 460 and 502, May 14, 1913, corrected by Dr. Maxon and Dr. Robinson; Neutral Strip, Carleton 367, August 1, 1891, determined as *C. Lindheimeri*, and now corrected by Dr. Maxon; Pawnee County, Greene, in Am. Fern Journ. 8: 59. 1918, as *C. tomentosa*, corrected by Bush; Quanah Mountain, Comanche County, Sheldon 193, July 1891; Quanah Mountain, Sheldon 234, July 28, 1891, verified by Dr. Maxon; Tishomingo, Johnston County, Palmer 6424, September 7, 1914; Osage County, Greene, April 28, 1917, as *C. tomentosa*.

This species and *C. tomentosa* are so generally confused by collectors that some of the specimens cited under the latter may belong to *C. Eatoni*.

31. *CHEILANTHES FEEI* Moore, 1857.

Osage County, Greene, 1918; Oklahoma, Greene in Am.

Fern Journ. 27: 127. 1927; Rogers County, *Greene*, May 20, 1923; Cimarron County, *Greene*, date not given; White Horse Springs, *Greene*, September 6, 1923; Osage County, *Greene*, May 25, 1918; Caddo County, *Greene*, 1918; Kenton, Cimarron County, *Stevens* 500, May 14, 1913; Fairvalley, Woods County, *Stevens* 1662, July 10, 1913; Kenton, Cimarron County, *Stevens* 488, May 15, 1913; Neutral Strip, Cimarron County, *Carleton* 368, August 1891.

32. *CHEILANTHES LANOSA* (Michx.) Watt, 1874.

Cement, Caddo County, *Greene*, April 6, 1918; Cleveland, Pawnee County, *Greene*, November 23, 1916; Comanche County, Mrs. Nice, in *Greene* in Am. Fern Journ. 27: 128. 1927; Indian Territory, Maxon in Check List, 1901; Oklahoma, *Greene*, in Am. Fern Journ. 27: 128. 1927; Cherokee County, *Blankinship*, August 18, 1895, determined by Dr. Robinson; Granite, Greer County, *Stevens* 1009, June 17, 1913, determined by Dr. Robinson and verified by Palmer; Muskogee, Muskogee County, *Palmer* 11202, November 3, 1915; Osage County, *Greene*, 1918; Pawhuska, Osage County, Bogue in Catalogue, 7. 1900; Osage County, *Greene*, March 19, 1918; Pawnee County *Greene*, 1918; Poteau, Le Flore County, *Palmer* 8264, July 12, 1915; Tishomingo, Johnston County, *Palmer* 6425, September 7, 1914; Sapulpa, Creek County, *Bush* 842, September 30, 1894, verified by Dr. Robinson; Wichita Mountains, Comanche County, *Sheldon* 211, July, 1891; Sand Springs, *Greene*, date not given; Dripping Spring, Ottawa, Ottawa County, Wherry, in Am. Fern Journ. 62. 1928.

33. *CHEILANTHES WOOTONI* Maxon, 1918.

Cimarron County, *Greene*, in Am. Fern Journ. 27: 128. 1927; Wichita Mountains, Mrs. Nice, in *Greene*, in Am. Fern Journ. 27: 128. 1927.

34. *CHEILANTHES TOMENTOSA* Link, 1833.

Cache, Comanche County, *Palmer* 12588, July 19, 1917; I have not seen Palmer's specimens and I feel some doubt about this determination, as they may be *C. Eatoni*; Okemah, *Greene*, date not given; Oklahoma, *Greene* in Am. Fern Journ. 27: 128. 1927; Okemah, Okfuskee County, *Greene*,

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35. *CHEILANTHES HORRIDULA* Maxon, 1918.

Oil Creek and Turner's Falls in the Arbuckles, *Greene*, in Am. Fern Journ. 27: 127. 1927.

(*Cheilanthes Lindheimeri* Hooker, 1858).

Carleton's specimens No. 367, upon which this name rests in Holzinger's report of Carleton's collection, are *C. Eatoni*, according to Dr. Maxon q. v.

36. *NOTHOLAENA DEALBATA* (Pursh) Kunze, 1848.

Osage County, *Greene*, June, 1818; Rogers County, *Greene*, May 20, 1923; Oklahoma, *Greene*, in Am. Fern Journ. 27: 127. 1927; Crusher Spur, Murray County, *Stevens* 48, April 14, 1913; Miami, Ottawa County, *Stevens* 2310, August 26, 1913; Osage County, *Greene*, in Am. Fern Journ. 8: No. 2. 59. 1918; Osage County *J. H. Kimmons*, August 31, 1895; Woods County, *Stevens*, 1913.

Should be common in Northern and Eastern Oklahoma, on faces of limestone bluffs and on boulders.

37. *NOTHOLAENA STANDLEYI* Maxon, 1915.

Black Mesa, Kenton, Cimarron County, *Stevens* 462, May 14, 1913; Headquarters Mountain, Granite, Greer County, *Stevens* 1043, June 17, 1913; Jones' Ranch, Baca County, Colorado, just over the State line, *Greene*, no date; Headquarters Mountain, Granite, Greer County, Mrs. Nice, in *Greene*, in Am. Fern Journ. 27: 127. 1927; Cimarron County, Mrs. Nice, in *Greene*, in Am. Fern Journ. 27: 127. 1927; Granite, Greer County, *Greene*, May 4, 1918, determined by Dr. Maxon; Chickasha, Grady County, *Greene*, 1918, determined by Dr. Maxon.

38. *NOTHOLAENA SINUATA* (Swartz) Kaulf. 1824.

Falls Creek, Arbuckle Mountains, Greene, in Am. Fern Journ. 27: 127. 1927.

(*Notholaena Hookeri* D. C. Eaton, 1879).

The use of *Hookeri* as a specific name in this genus is invalidated by *N. Hookeri* Lowe, 1856, the species of Oklahoma receiving a new name, *N. Standleyi*, q. v.

39. *POLYPODIUM POLYPODIOIDES* (L.) A. S. Hitchcock, 1893.

Arbuckle Mountains, *Greene*, August 28, 1911; Sand Springs, *Greene*, date not given; Okfuskee, *Greene*, date not given; Oklahoma, *Greene*, in Am. Fern Journ. 27: 127. 1927; Murray County, *Greene*, 1918; Osage County, *Greene*, March 19 1917; Osage County, *Greene*, in Am. Fern Journ. 8: No. 2. 60. 1918; Cavanal Mountain, Poteau, Le Flore County, *Palmer* 9052, October 28, 1915; Page, Le Flore County, *Palmer* 20958, April 27, 1922.

Should be found in Eastern and southeastern Oklahoma, on sandstone boulders and faces of bluffs.

(*Polypodium virginianum* L. 1753).

Collected by Palmer at Magazine Mountain, Arkansas, and recorded by Harvey in Ferns of Arkansas as common in northwestern Arkansas, on sandstones and moss-covered trees, and should be found in the mountainous parts of Eastern Oklahoma.

40. *MARSILEA VESTITA* Hook. and Grev. 1831.

Alfalfa County, *Stevens* 645, 1913; Johnston County, *Stevens* 3465, 1913; Payne County, *Stevens* 380.1, 1913; Sapulpa, Creek County, *Bush* 838, June, 1894; Sapulpa, Creek County, *Bush* 839, September, 1894; Texas County, *Stevens* 562, 1913; Without definite locality, Bogue in Catalogue, 7. 1900; Woods County, *Stevens* 383, 1913.

41. *MARSILEA TENUIFOLIA* Englem. 1848.

Oklahoma, *Greene*, in Am.. Fern Journ. 27: 129. 1928. I have not been able to see any specimens of this species, which may be only a form of the preceding.

42. *AZOLLA CAROLINIANA* Willd. 1810.

Verdigris, Rogers County, *Stevens* 383, 1913.

43. EQUISETUM KANSANUM Schaffner, 1912.

Lamont, Grant County, Stevens VRJD, August 2, 1913, as *E. variegatum*; Boise City, Cimarron County, Stevens 505, as *E. hyemale*; Lamont, Grant County, Stevens 1799, August 2, 1913, as *E. variegatum*; Waynoko Woods County, Stevens 1776, July 24, 1913, as *E. variegatum*; Fairvalley, Woods County, Stevens 755, May 28, 1913, as *E. hyemale*; Woodward, Woodward County, Eggert, June 6, 1901, as *E. laevigatum*.

44. EQUISETUM PRAEALTUM Raf. 1817.

No specimens of this species have been seen, but no doubt it occurs along the bottoms of the larger streams in Eastern Oklahoma.

45. EQUISETUM PRAEALTUM LAEVIGATUM (A. Br.) n. comb.

Choctaw County, H. W. Houghton, June 5, 1916, as *E. robustum*; Davis, Murray County, Emig 675, July 1, 1916, as *E. robustum*; Logan County, Greene, 1918; Osage County, Greene, March 19, 1917; Osage County, Greene, in Am. Fern Journ. 8: 60. 1918, as *E. hyemale*; Oklahoma, Greene, in Am. Fern Journ. 27: 129. 1927; Pawnee County, Greene, 1918. Pittsburg County, Sheldon 140, July 11, 1891, determined by Holzinger as *E. robustum*, but I am referring it here, and I am supported in this by Dr. Maxon; Pawhuska, Osage County, Stevens 1934, August 8, 1913, as *E. robustum*; Sapulpa, Creek County, Bush 836 July 30, 1894, as *E. robustum*; Ske-dee, Pawnee County, Greene, November 15, 1916; without definite locality, Bogue in Catalogue, 8. 1900, as *E. robustum*; Woods County, Stevens 370, 1913, as *E. hyemale*.

46. SLAGINELLA RUPESTRIS (L.) Spring, 1840.

Creek and Pawnee Counties, Greene, 1918: Osage County, Greene, in Am. Fern Journ. 8: No. 2. 59. 1918; Sapulpa, Creek County, Bush 835, September, 1894; Shamrock, Creek County, Greene, September 1, 1916; Oklahoma, Greene, in Am. Fern Journ. 27: 129. 1927.

47. SLAGINELLA SHELDONI Maxon, 1918.

Quanah Mountain, Comanche County, Sheldon 233, July 28, 1891, TYPE; Maxon, in Proc. Biol. Soc. Wash. 31: 172., Dec. 30, 1918; Chickasha, Grady County, Greene, July 10,

1918; Maxon, in Proc. Biol. Soc. Wash. 31: 172, Dec. 30, 1918; Headquarters Mountain, Granite, Greer County, Greene, May 4, 1918, Maxon, in Proc. Biol. Soc. Wash. 31: 172, Dec. 30, 1918; Wichita Mountain, Greene, in Am. Fern Journ. 27: 129, 1927; Quanah Mountain, Sheldon, TYPE, Greene, in Am. Fern Journ. 27, 129, 1927; Headquarters Mountain, Granite, Greer County, Greene, May 4, 1918, determined at first by Dr. Maxon as *S. Wrightii*, but Dr. Maxon now writes me that Greene's specimens are probably an undescribed species, so I am unable to give the name of the species until he has described it; Quanah Mountain, Comanche County, Sheldon 233, July 28, 1891, determined at first as *S. rupestris*, but now named as the type specimens.

48. *SELAGINELLA UNDERWOODII* Hieron. 1901.

Jones' Ranch, Baca County, Colorado, just a few rods over the line, Greene, in Am. Fern Journ. 27: 129, 1927. (*Slaginella apoda* (L.) Fernald, 1915).

Collected along wet shaded banks of Elk River, near Southwest City, Missouri, by Bush, and at Magazine Mountain, Arkansas, by Palmer and undoubtedly occurs in the mountainous parts of Eastern Oklahoma.

49. *Isoetes Butleri* Engelm. 1878.

Limestone Gap, Atoka County, Butler, 1875; Limestone Gap, Atoka County, Butters; Engelmann in Botanical Gazette 3s 1. 1878, *type*; Limestone Gap, Indian Territory, Underwood in Our Native Ferns, 1900; Oklahoma, Britton & Brown in Ill. Flora; Oklahoma, Gilbert in N. A. Pteridophytes, 1901; Oklahoma, Robinson and Fernald in Manual, 1908; Oklahoma, Maxon in Check List, 1901; Oklahoma, Small in Flora 1913.

50. *Isoetes melanopoda* J. Gay, 1864.

Limestone Gap, Atoka County, Butler, 1875; Limestone Gap, Atoka County, Butler; Engelmann in Botanical Gazette, 3 1. 1878; Limestone Gap, Atoka County, Butler; Underwood in Our Native Ferns, 1900; Oklahoma, Butler; Maxon in Check List, 1901; Oklahoma, Robinson and Fernald in Manual, 1908.

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